Central Counterparty Clearing and Systemic Risk Insurance in OTC Derivatives Markets*

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Abstract

How can Central Counterparty (CCP) clearing help to make the over-the-counter (OTC) derivatives market safer? To answer this question, we lay out two views of risk management. The "contract view" considers how to control the loss given default, while the "counterparty view" looks at the likelihood of a default first and, hence, at the incentives to take on risks. Applying the latter view to the market for OTC derivatives, we argue that the risk transfer that characterizes CCP clearing leads to incentives for individual risk-taking, as well as a collective failure of participants to take into account that the OTC derivatives market concentrates aggregate, system-wide risk. With central clearing this systemic risk externality worsens, as CCPs concentrate this risk further and become too-big-to-fail. To correct this problem, we propose the establishment of *systemic risk insurance* as a necessary component of CCP clearing in OTC derivatives markets.

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1 Introduction

In financial trades, obligations are usually agreed upon much before they are settled. Hence, counterparty risk – the risk that a counterparty defaults on its obligations – is an omnipresent feature of financial trading. Clearing concerns (i) establishing the legal certainty of the obligations from trading and (ii) ensuring the proper management of counterparty risk associated with these obligations. There are several ways to organize clearing with respect to the second notion. Clearing could be organized on a bilateral basis, whereby the two counterparties of a transaction control their mutual exposures directly. Alternatively, a specialized entity, a clearinghouse, could carry out clearing as a service to the counterparties.[1] The clearinghouse can offer other services too that range from determining the type of eligible collateral, its amount, unraveling trades in case of default and so on.

The most far reaching risk management technique is when counterparty risk is entirely transferred to a clearinghouse that acts as a central counterparty (CCP). With this risk transfer, the counterparties to a trade do not retain any direct default exposure, while the CCP assumes all of it. In practice, this is commonly expressed as the legal concept of novation, where the CCP becomes "the seller to every buyer and the buyer to every seller" in a financial market. As a consequence, the CCP often guarantees the terms of the original trade for its members. To make this guarantee credible, the CCP needs to employ risk management instruments itself such as margins, default funds and loss sharing rules.[2] We would like to stress here that from an economic perspective, it is the risk transfer that matters for CCP clearing: it leads to a change in exposures against counterparty risk for market participants, but need not necessarily amount to a full guarantee of the trades.

In this article, we ask how CCP clearing can help to make the OTC derivatives market safer, a market that has been identified as a source of unregulated, system-wide risk in the financial system. We start by outlining two competing views of risk management and, thus, clearing. The contract view considers primarily the loss given default of a financial transaction, while the counterparty view looks at the likelihood of default first, and especially the incentives of

[1] See Monnet (2010) for other forms of clearing arrangements that we do not cover here.

[2] For a good description of the more technical aspects of these instruments, see Duffie (2011).

counterparties to take on risk.

Much of the discussion about CCP clearing in general, and for OTC derivatives in particular, has adopted the first approach and stresses the benefits of risk reduction. However, using the later view, we point out that these benefits are questionable, as the risk transfer that characterizes CCP clearing leads to incentives for *individual* risk-taking and, thus, necessitates additional collateral increases. Even though requiring additional collateral with CCP clearing can control risk exposures, it fails to take into account a systemic risk externality that the participants in the OTC derivatives market exert *collectively* on the financial system. Once risk is concentrated, the CCP is simply too-big-too-fail and market participants will exploit this fact. As a result, we argue that *systemic risk insurance* should be a pivotal component of central clearing in this market.

2 What Matters Most: Contract or Counterparty?

2.1 The Contract View

After establishing legally binding obligations from trading, clearing manages the risk associated with a financial trade. In the contract view, risk management takes the trade as given and focuses primarily on the potential loss given that a default occurs. When a default takes place, there is a direct financial loss: One needs to close out positions at unfavorable terms (often called market or price risk) or one needs to replace certain transactions to maintain an overall position in financial markets (usually referred to as replacement cost risk).

The process of clearing puts controls on overall trading positions and quantifies the losses that could occur from these. Thus, risk managers devise models to price the value of the trading position at all times. From these models, one calculates margin requirements and adjusts these when changes in prices or market conditions affect the size of losses that one can expect from the trade. With this traditional approach, it is of less concern why the trade has taken place, why it has been carried out with a specific counterparty and what the likelihood of a

default would be.[3]

2.2 The Counterparty View

The counterparty view reverses the emphasis from the loss given default to the likelihood of a default. Risk management that operates under the counterparty view seeks to minimize first and foremost the probability of a default. Only then does it consider the potential losses from a default. In practice, good risk management should take both views into account and devise different clearing rules for different counterparties.

With this approach, assessing and monitoring the quality of a counterparty until settlement is crucial. If the likelihood of a default was entirely exogenous and observable, one could simply decline any trade opportunities with a very risky counterparty. However, the probability of a default cannot be taken as exogenous, as some counterparties are more likely to default than others: A counterparty might take on undue additional risk before a trade gets settled or might not always have an interest to settle the trade according to the terms that have been agreed upon.

Hence, this approach recognizes that incentives matter. When considering counterparty risk one should worry not only about the ability, but also about the willingness of a counterparty to settle an obligation. Unfortunately, evaluating this issue is not as straightforward as pricing a contract in order to assess a potential loss given default. Still, ideal risk management practices should give incentives to a counterparty to make good on an obligation in timely fashion as well as not to engage in additional risk taking.

3 From Bilateral to CCP Clearing

In the absence of centralized clearing arrangements, financial institutions clear their trades on a bilateral basis. Therefore, institutions are directly exposed to the risk that their coun-

[3]See for example Haene and Sturm (2009) and Nahai-Williamson et al. (2012) who follow this approach in the context of CCP clearing.

terparty defaults and, consequently, limit exposures to counterparties that are more likely to default. Hence, with bilateral clearing, financial institutions tend to employ both views of risk management, first taking a counterparty view of risk management, while contract risk considerations only come second.

The introduction of CCP clearing has changed this ordering in important ways. A CCP pools transactions from different counterparties and takes on the counterparty risk from these transactions. Hence, *given* a set of trades to be cleared, the CCP reduces counterparty risk exposure for all trades. But with this risk transfer, financial institutions do not directly bear the default risk of their counterparty any longer and, thus have little incentives to monitor their counterparty's default risk. Independent of the financial market being considered, this implies that CCP clearing involves a typical trade-off between the direct benefits of risk reduction and the counterparties' incentives to internalize risk correctly. The contract view of risk management mainly argues here for benefits from risk reduction, while the counterparty view calls into question the importance of such gains.

3.1 Reduction in Counterparty Exposure

By taking on the default risk from a set of trades, a CCP is able to achieve a *reduction* of counterparty risk exposure in the aggregate. As a result, the CCP can lower collateral requirements relative to what its members would require when clearing bilaterally. There are two reasons for this reduction, the pooling of counterparty risk and the netting of exposures by novation.

First, through the risk transfer, the CCP is able to pool counterparty risk. As a result, all members of the CCP are only exposed to the average default probability, but not anymore to the idiosyncratic risk that one's counterparty will default. Considering the probability of default of each member as exogenous, the CCP can predict the average default probability. For this case, Koeppl and Monnet (2011) show that, once default risk is pooled, diversification of default risk will lower optimal collateral requirements in CCP clearing.

Second, through novation, the CCP is responsible for the obligations for each and every trade.

It is then able to net overall exposures across all of its participants and, consequently, reduce exposures even before default becomes an issue. Lower overall default exposures automatically bring about a reduction in collateral requirements relative to what bilateral clearing would require. Importantly, there are gains, both from netting similar financial contracts across a wide range of counterparties, and from netting very different financial contracts across any set of counterparties.[4]

3.2 Increase in Counterparty Risk

These arguments for the reduction in counterparty exposure are mainly based on the contract view. We now argue that CCP clearing can also lead to an increase in collateral requirements, as it changes the assessment of how likely defaults in financial transactions are. This can be simply the result of a CCP having better information on trading positions. But, more importantly, it can also result from a change in the individual incentives of counterparties to take on risk, once CCP clearing has been introduced. As a consequence, CCPs may be forced to require more collateral, thus making it more costly to clear trades through a CCP than bilaterally. There are several, formal arguments for why counterparty risk is perceived to be higher with CCP clearing.

First, traders have imperfect information about the total risk exposures of their counterparties and, hence, underestimate the default probability when clearing bilaterally. The CCP has an advantage in that it can observe all trades submitted by its members.[5] Hence, the CCP can judge overall risk exposure better and, therefore, can adjust collateral requirements to a more appropriate level.[6] More generally, the contracting parties might also not take into account

[4]Duffie and Zhu (2010) point out that the degree of netting efficiency (relative to bilateral netting) depends on how CCP clearing will be organized across different financial market segments and participants. In particular, netting efficiency can be severely restricted, whenever CCP clearing is sufficiently fragmented across borders and products. More fragmented clearing thus requires a high degree of interoperability between CCPs in order to increase netting efficiency and to achieve more collateral savings.

[5]See Leitner (2009).

[6]Carapella and Mills (2012) derive a different benefit from CCP clearing based on this information asymmetry. Their main idea is basically that, being insured through novation, participants of a CCP have less

the social costs associated with individual defaults and, hence, underprice default risk relative to what is socially optimal.

Second, there is little evidence that a CCP can gather more information about the quality of a counterparty relative to what is available under bilateral clearing. Koeppl (2012) argues that market participants have an informational advantage in judging the incentives for a counterparty to take on risk. If, once insured, the counterparties have an incentive to collude on risk-taking[7] to increase their expected surplus from trading, CCP clearing will have to charge more collateral on trades to control risk and thus will make formal clearing more expensive.

Third, with CCP clearing traders have little incentives to keep monitoring the quality of their counterparties. This will force the CCP to ask for more collateral, unless it can ensure high counterparty quality through access requirements. But more stringent access requirements lower the gains from risk reduction through netting.

Fourth, Koeppl and Monnet (2011) show in the context of OTC markets that market power can lead to a misallocation of risk across trades. When dealers have market power they choose their trades such as to extract rents without taking into account how their trade affects counterparty risk. This leads to too much counterparty risk relative to the social benefits from the underlying transactions. For instance, dealers could have little incentives to satisfy hedging needs of end users in derivatives markets as they expect higher private rents from risky trades that originate from a purely speculative motive.

Finally, it is important to recognize that introducing CCP clearing changes market structure. Scholars have long recognized that CCP clearing can foster liquidity by allowing market participants to remain anonymous.[8] But CCP clearing can also weaken liquidity, when trading costs increase due to higher collateral requirements. Less liquid markets can adversely affect market discipline, as market participants might have less incentives to break off rela-

incentives to acquire information about default risk when markets are stressed. Hence, trading decisions becomes less information sensitive which stabilizes trading in equilibrium.

[7]For OTC derivatives transactions, such collusive risk-taking is more likely to be a problem in trading among dealers than in trades involving end-users of derivatives that intend to hedge some basic risk.

[8]See Kroszner (1999).

tionships with other counterparties if these are deemed to take on too much risk. In such a scenario, market discipline cannot necessarily substitute for collateral anymore resulting in an amplification of collateral requirements for centrally cleared transactions.[9]

3.3 A Lesson for the Design of CCP Clearing

From the arguments above, we can conclude that a CCP has to worry about which counterparty risk it accepts when clearing trades. This implies that CCP clearing needs to follow a two step process. It first needs to determine the range of counterparties it accepts for clearing – through membership requirements and rules for indirect clearing where members act as clearing agents. Then the CCP should decide about what contracts to clear for those counterparties and how to manage market or price risk and the replacement cost risk on those contracts.

Managing this risk is costly and this cost should be taken into account when deciding on the scope for CCP clearing. Facing very risky counterparties, a CCP could cover a large portion of the loss given default through margins and default funds. To the contrary, relatively safe counterparties expose the CCP to much lower default risk and, hence, could give some leeway in covering losses. Hence, given the trade-off in collateral costs that CCP clearing entails, one needs to find a good reason for why CCP clearing should be introduced for a particular financial market that is characterized as much by its set of participants as by the financial product that is traded.[10]

This is particularly true for the discussion about how to introduce CCP clearing for the OTC derivatives market. For this market, many have argued that clearing should be restricted to standard contracts, in view of netting being the prime benefit of CCP clearing. For example the Dodd-Frank Act in the US or EMIR in Europe require a large share of OTC derivatives

[9] See Koeppl (2012) for a formal derivation of this argument.

[10] In practice, a lot of attention is given to the type of contracts a CCP should clear and how one can devise a quantitative model for setting variation margins to partially cover losses given default. Whether the characteristics and incentives of the market's participants make any market conducive to CCP clearing seems to be secondary.

contracts to be moved to exchanges and electronic trading platforms that offer CCP clearing by the end of 2012. These proposals focus on "sufficiently standardized" derivatives contracts. There is little or no discussion about which counterparties should have access to or be required to clear their derivatives transactions through a CCP – independent of whether they trade standardized or customized derivatives products.[11]

Moreover, there has been a push to increase collateral requirements to cover potential losses from OTC derivatives transactions after netting without giving much consideration to the characteristics and incentives of the important counterparties in this market. The ISDA (ISDA, 2012) crudely estimates a large increase in collateral requirements of around 1-2 trn USD. This range arises from using an estimate of netting efficiency and both, estimates for the fraction of uncollateralized transactions and the total collateral in circulation. In another exercise that also takes the contract view, Heller and Vause (2012) use a much more sophisticated approach that relies on typical risk management parameters for clearing. Assuming a relatively standard margining model for clearing and time varying volatility for price changes, they conclude that additional margin requirements amount to roughly 1 trn USD.[12]

For the reasons we have outlined, these reported costs might underestimate the true costs for clearing OTC derivatives centrally. In addition, netting efficiencies are likely to be smaller than in many other financial markets given that many derivatives contracts are customized. This seems to indicate that OTC derivatives markets are much less conducive to central clearing, or that dealers will be reluctant to clear centrally, since it will be more cost effective to do so bilaterally.[13] But, as we will argue in the remainder of this article, OTC derivatives

[11]Clearing customized products is not without challenges. Hull (2010) however points out that customized derivatives products can be cleared centrally, when internal pricing models are delivered by the contracting parties to the CCP. This would require, of course, sufficient expertise at the CCP to evaluate such models. More importantly, Hull (2010) also argues that customized contracts should be cleared through a CCP, since otherwise they offer the potential to circumvent any effort to make derivatives markets safer.

[12]Heller and Vause (2012) also point out that default funds would not have to be increased dramatically to insure fully against the costs of default by at most two dealers, provided one relies on promptly adjusted variation margins.

[13]This will also be the case should CCP clearing lead to a highly fragmented market, where some dealers

markets concentrate system-wide risk and thus may require the establishment of a systemic risk insurance.

4 CCP Clearing and Systemic Risk Insurance

4.1 From Collecting Risk to Systemic Risk

The main role of the OTC derivatives markets is to allocate aggregate, economy-wide risk. End-users of derivatives contracts typically hedge against this risk and shift it to large participants that intermediate this market, whom for simplicity we will refer to as dealers. Once collected from end-users, dealers warehouse this risk, distributing it among themselves, keeping portions on their books or selling it off to other important financial institutions that are willing to take on the risk. However, the risk remains concentrated in the hand of the dealers and these other participants.

The total overall exposures of these market participants are very large. Most recent data based on BIS Statistics in 2011, show a gross market value of all derivatives contracts of about 28 trn USD.[14] If CCPs were to exploit most netting opportunities, some estimates point out that gross credit exposures in this market would still amount to around 4 trn USD or roughly 25% of US GDP.[15] Based on these figures, many have argued that CCP clearing should be made mandatory for derivatives in order to reduce risk arising from OTC derivatives trading.

CCP clearing cannot do away with the aggregate, economy-wide risk that is concentrated in OTC derivatives markets. Still, a CCP can at least partially safeguard against this risk by adopting costly margin requirements and by charging default fund contributions to its members. But this transfer of counterparty risk in OTC derivatives market makes CCPs operating in this market segment the most important risk nodes of the entire financial system.

could possibly achieve a higher bilateral netting efficiency.

[14]The BIS Statistics on OTC Derivatives cover major dealers operating in G10 countries, Switzerland and recently, also a few other countries.

[15]See for example ISDA (2012). This source, however, is likely to overestimate netting benefits, especially if one expects clearing to be fragmented across different CCPs.

In other words, once risk has been concentrated within a CCP, it becomes systemic risk: When the failure of a single large participant in the OTC derivatives market was enough to endanger the entire financial system prior to introducing CCP clearing[16], so will be the failure of a CCP that clears derivatives.[17] Consequently, in a system-wide crisis governments will have no other choice than to bail out CCPs. By concentrating aggregate risk on their books, CCPs operating in the OTC derivatives market will be too-big-too-fail.

Dealers will recognize this fact and will continue not to have any incentives to price fairly the aggregate risk that they take on – a fact that we call systemic risk externality. What makes matters worse is that market participants will have every incentives to individually and collectively channel risk into the derivatives markets that are cleared through CCPs. In other words, CCP clearing even increases the systemic risk externality. Ultimately, the public faces the possibility of a costly bailout, even though CCP clearing on the OTC derivatives market was meant to reduce this risk in the first place. Can CCPs then make the OTC derivatives market really safer and can they avoid that the costs of financial crises are ultimately born by taxpayers? Based on the counterparty view, we argue next that CCP clearing can indeed help – by better insuring against systemic risk.

4.2 Structure of Systemic Risk Insurance

The main idea of a systemic risk insurance is to finance the costs of a bailout by levying a tax on dealers which are the ultimate source of a possible bailout. CCPs would be required to charge dealers a premium for taking on net derivatives positions. The premium would increase with the net position for any given market participant. Through this additional premium,

[16]The prime example in the current crisis is AIG. Even though it used not to be a large dealer for CDS derivatives, as the ultimate holder of the risk it built up $540 billion of one-sided exposures related mostly to asset-backed security products. A failure of AIG would have rippled through the entire market causing wide-spread losses for other dealers and financial institutions. Some commentators have labeled this problem also as too-interconnected-to-fail.

[17]As history has shown, CCPs are not immune to failing. For a brief description of CCP failures and near failures, see IMF (2010). Bernanke (1989) describes the problems clearinghouses faced in the wake of the 1987 crash in more detail.

the CCP would build up reserves over time before a crisis occurs. The reserves would be used to cover part of the cost arising from defaults in case of a system-wide crisis. Facing this premium, CCP members would internalize the systemic consequences of taking on additional risk. Consequently, the premium would need to be set to reflect the costs associated with wide-spread defaults in the financial system, so that these costs could be charged back to dealers in the OTC derivatives market.

There is a clear distinction between standard collateral tools and systemic risk insurance. While margins are set with respect to actual net positions to cover a range of losses, they are reimbursed once these positions are settled. Similarly, default fund contributions are set as a fixed cost for the members of a CCP, do not change over time and do not reflect the contribution to systemic risk of individual clearing members. To the contrary, the premiums on derivatives trades charged for the insurance fund are not reimbursed and must be seen as a pool of reserves, growing over time to cover a rarely occurring, extreme event.

When dealing with defaults, a "waterfall" approach would still apply with CCP clearing. Margins posted by all defaulting counterparties would be used first to cover default losses, then default funds from all other clearing members and ultimately the capital position of the CCP itself. Of course, these risk management tools need to be set according to best principles as outlined by CPSS recommendations[18] and need to be monitored regularly by a supervisory institution, to avoid regulatory arbitrage by owners and/or clearing members of the CCP. Only if the regular resources of the CCP are not sufficient, could the systemic risk fund be used to cover the remaining losses.[19]

As with other insurance against aggregate risk, the optimal path for building up reserves through premiums is an open question. Building up the reserve fund is costly[20] and it is

[18]CPSS/IOSCO (2012).

[19]One could imagine a supervisory institution to give formal approval for using the fund. Timing will not be an issue as temporary liquidity support could be given to the CCP with the fund being used ex-post to cover the costs of such support. One could also imagine that the fund could be used as bridge financing for rebuilding the CCP's capital.

[20]A related issue is how to invest the premiums. In particular, returns on investing reserves are likely to be low precisely when these reserves are needed to be paid out. This is likely to restrict the investment portfolio

neither optimal nor likely that the CCP raises sufficient funds quickly enough to cover all bailout costs in all possible circumstances. Hence, in case it is needed, some sort of public liquidity support should be provided to smooth out over time as much as possible the costs of this aggregate risk insurance. The support should take the form of a temporary loan to the CCP at market rates in the event that the systemic risk fund is not enough to cover the costs of a wide-spread default. To pay back the loan, the CCP would raise additional fees on clearing members beyond standard clearing fees and margin requirements. In this way, the cost of a bailout would also be levied on dealers post crisis.

Why is a CCP that clears derivatives the natural institution to administer such a program? As its core business, the CCP provides services such as acting as a trade repository, netting trades by novation, setting and administering margins and default funds. These services put a CCP into a unique position, combining the expertise and information to assess risk from a systemic perspective. Furthermore, through a well-designed margin policy and appropriately set default funds, the CCP would still safeguard against individual failures thereby reducing the likelihood of contagion and systemic events. Hence, running a systemic risk insurance program would be an additional service that complements other, more standard CCP arrangements.

4.3 Challenges ahead

From our earlier analysis, the scope of the fund is well defined, when viewing it as insurance against systemic risk. The CCP needs to comprise all systemically important players and all OTC derivatives products that are deemed of systemic importance. Of course, it is not easy to define which counterparties are systemically important as this status is likely to change significantly over time. However, once the relevant counterparties have been determined, *all* contracts of these players – independent of how standardized they are – need to be covered by the CCP's systemic risk fund. Otherwise, these market participants could circumvent systemic risk insurance by taking on positions in derivatives contracts outside the reach of

for the fund.

CCP clearing.[21]

Derivatives products are very diverse and dealers tend to operate internationally across many different market places. This could limit the possibility of a single CCP running the fund. Clearinghouses tend to be restricted by the legal jurisdiction under which their members operate,[22] the currency denomination of contracts or the type of derivatives contracts they specialize in for clearing. From a practical perspective, one idea could be to introduce a hybrid solution, where a CCP at the apex of the clearing infrastructure would oversee the many clearinghouses specialized along these different market segments. This clearinghouse – sometimes labeled a Meta-CCP[23] – could take over the administration of the systemic risk insurance fund. Nonetheless, this tiering of clearing infrastructure would reintroduce many issues and concerns that range from fragmented information across markets to regulatory arbitrage among market participants.

Systemic risk insurance through a CCP will not be immune to moral hazard, but it seems likely that the costs are much smaller in this context than with standard insurance problems. First, participants do not consider the systemic consequences of their trading in the first place, which systemic risk insurance is meant to correct. The insurance premiums are borne by dealers and should increase with risk-taking so that the design of the insurance fund takes into account the systemic-risk externality in building up derivatives positions. In other words, systemic risk insurance will charge OTC derivatives transactions directly for increasing systemic risk and, thus, will counteract – albeit not eliminate – risk concentration in this sector. Second, to free ride on other clearing members, an institution would have to take an extreme position, a position that is so large that it ends up affecting the mere viability of the CCP itself. It is unlikely that a CCP could not obtain information quickly about such an intention and react appropriately by limiting positions taken up by any particular member. Third, insurance

[21]Bank capital charges for customized derivatives that are not centrally cleared would not necessarily be an alternative. Such charges do not reach all systemically important players. They also do not capture the fact that resources against rare systemic events are optimally built up over time.

[22]Considerations of national oversight and concerns about giving up regulatory oversight could be an additional barrier to run the fund across borders or even different market segments.

[23]See Maegerle and Nellen (2011) for describing this idea in the context of netting across segmented CCPs.

is only for the entire system, but not individual counterparties. This implies that clearing members would have to coordinate their actions in order to actively increase system-wide risk beyond what is covered through the premium charged. In other words, the systemic-risk fund would be primarily subject to collective moral hazard.[24] For these reasons, moral hazard seems likely to be less of a concern in the context of the systemic risk fund.

4.4 Link to Similar Proposals

It is instructive to first draw a parallel to catastrophe risk insurance, since there are many similarities.[25] The idea is to partially insure against losses due to a natural (or man-made) disaster by building up reserves over time. The main problem is again how fast and to what degree one should build up reserves to enable such insurance, given the unpredictable nature and size of a catastrophic event. It is also likely that one needs to recover some of the losses associated with a catastrophe over time *after* the event has occurred. Again, the only institution that can ensure such an arrangement is the government that can spread the costs over the current and future generations through borrowing. But here the similarities end. The risk bearing capacity of private insurance providers is very limited with catastrophe insurance, so that the government (and, thus taxpayers) must take on a significant portion of the risk. With systemic risk insurance one tries to correct an externality that arises when dealers take on aggregate risk. Thus, the main intention is to price this risk correctly and charge the costs of risk-taking back to dealers.[26]

Kashyap et al. (2008) were the first to propose an insurance scheme for situations where the entire banking sector needs to be recapitalized. This insurance would pay off precisely when

[24]Here, systemic risk insurance could be complemented with other macro-prudential instruments that would limit this problem.

[25]See Gollier (2005) for a review on catastrophe risk insurance.

[26]There are also important differences with deposit insurance for banks which was introduced to build up a fund to insure depositors against losses. The fund is not nearly large enough to cover a large proportion of deposits in the banking sector. This can be understood from the fact that the primary function of this fund is to prevent bank runs based on mere rumors about the health of individual banks.

the overall banking sector needs to be bailed out, regardless of the health of any given bank.[27] Archaya et. al. (2010) are more detailed in their analysis and recognize that systemic risk is an externality along similar lines that we have presented here. Financial institutions do not take into account that their default will have consequences for the entire system. Systemic crises occur when the entire financial system is undercapitalized and requires an injection of outside funds. The authors' basic idea is to price out this risk and to force banks to insure it with private insurance providers that cover recapitalization in such an event.[28]

We add two crucial insights to these proposals. First, we have pointed out that in the modern financial system derivatives transactions are the primary source for systemic risk, as they concentrate aggregate, system-wide risk. Introducing CCP clearing can help to alleviate risk exposures in this market, but it can make systemic risk even worse. Hence, regulatory efforts need to tackle the problem in this market directly. The tax or premium would be levied on the net position in derivatives and needs to cover all market participants that increase systemic risk in order the internalize the costs associated with the externality. Notwithstanding, a CCP seems to be the natural institution for running systemic risk insurance for reasons we have outlined above.

Second, we really view the fund as *insurance* against an aggregate, infrequently occurring shock that cannot be completely avoided. Key in our proposal is to build up sufficient resources over time within the system to cover losses associated with this aggregate shock. This requires support through public funds in order to achieve an optimal *intertemporal* allocation of the insurance costs. Still, the support needs to be priced as well, so that the costs are charged back to financial market participants before and after a crisis.

[27] Kocherlakota (2010) outlines a related proposal that internalizes the costs of being too-big-to-fail – and, hence, systemically important – by taxing individual financial institutions.

[28] There is no reason to expect that any insurance can be provided by private, financial market institutions. The potential supply for this insurance is likely to come from the very same institutions that would be required to buy the insurance. Hence, the problem becomes one of "But who insures the insurer?".

5 Conclusion

The traditional contract view on risk management dominates the discussion about CCP clearing. From this perspective, the contract and its properties are important for the feasibility and organization of clearing financial markets transactions centrally. However, when considering OTC derivatives markets, much can be gained from shifting the perspective to the counterparty view. According to this view, what regulators should be concerned with in OTC derivatives markets is aggregate, system-wide risk where extreme, but infrequent losses across dealers can happen. CCP clearing of derivatives concentrates risk further and creates the epitome of the too-big-to-fail problem. Our proposal is to complement traditional CCP clearing in this market with a systemic risk insurance fund that is financed through a tax on dealers' net derivatives positions. This fund internalizes the costs of defaults in terms of systemic risk and acts like insurance against systemic risk at the same time.

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